What is claimed is:

1. An apparatus, comprising:

an encryption processor including:

an execution unit configured to execute product and square operations, the execution unit including at least one adder and at least two multipliers;

a decode unit, coupled to the execution unit, the decode unit configured determine if a square operation or a product operation needs to be performed on an operand, the decode unit further configured to issue instructions so that certain multiply and/or addition operations are performed in parallel in the execution unit while performing either the square or product operation.

2. The apparatus of claim 1, wherein the decode unit is configured to execute a set of instructions that causes the execution unit to perform the multiplication and addition operations in parallel to reduce the number of cycles required to perform the product operation.

3. The apparatus of claim 1, wherein the first set of instructions causes the execution unit to perform the multiplication and addition operations in parallel to reduce the number of cycles required to perform the square operation.

4. The apparatus of claim 3, wherein certain of the multiplication operations are performed in parallel using a multiply and shift by one instruction.

5. The apparatus of claim 1, wherein the execution unit further comprises registers coupled to the multiplication units and the at least one adder.

6. The apparatus of claim 1, wherein the encryption processor further comprises a memory coupled to the execution unit and the decode unit.

7. The apparatus of claim 1, wherein the decode unit is further configured to decode an operation $M = C^d \bmod N$ by:

(a) determining the MSB position of the exponent d equal to a first logic state;

(b) issuing a first set of instructions to implement a square and a product operation after the MSB position of the exponent d equal to a first logic state is determined;

(c) determining if the next most significant bit (MSB) of exponent (d) is a of the first digital state or a second digital state; and either

(d) issuing a second set of instructions to the execution unit to implement a square operation if the next MSB is of the second digital state; or

(e) issuing the first set of instructions to the execution unit if the next MSB of the exponent is of the first digital state instructions to implement a square and a product operation; and

repeating (c) through (e) for every bit in the exponent (d) from the next MSB to the least significant bit (LSB).

8. The apparatus of claim 7, wherein the final result of the operation $M = C^d \bmod N$ by accumulating the results of (b) through (e). .

9. The apparatus of claim 1, wherein the encryption processor is located in a server and are used to establish a secure socket layer connection between the server and a client.

10. The apparatus of claim 9, wherein the encryption processor is embedded in a microprocessor within the server.

11. The apparatus of claim 9, wherein the encryption processor is contained on a dedicated processor which is coupled via a bus to a microprocessor in the server.

12. The apparatus of claim 1 wherein the product and square operations executed by the execution unit are Montgomery product and square operations.

13. The apparatus of claim 1, wherein the product and square operations are performed on operands having at least one of the following widths: 256 bits wide; 512 bits wide; 768 bits wide; 1,024 bits wide; 1536 bits wide; 2,048 bits wide; 3072 bits wide; 4,096 bits wide; 8,192 bits wide; 16,384 bits wide; 32,768 bits wide; or 65,536 bits wide.

14. The apparatus of claim 1, wherein the encryption processor is configured into a web server deploying Secure Socket Layer (SSL)/Transport Layer Security(TLS).

15. The apparatus of claim 1, wherein the encryption processor is configured into a secure switch deploying Secure Socket Layer (SSL)/Transport Layer Security(TLS).

16. The apparatus of claim 1, wherein the encryption processor is configured into an Internet load balance device with Secure Socket Layer (SSL)/Transport Layer Security(TLS) termination functionality.

17. The apparatus of claim 1 wherein the encryption processor is configured into an Internet appliance for a Virtual Private Network.

18. The apparatus of claim 1 wherein the encryption processor is configured into a security based router.

19. The apparatus of claim 1 wherein the encryption processor is configured into a remote access devices used for VPN applications.

20. The apparatus of claim 1, wherein the encryption processor is configured into one or more of the following: concentrator-based security systems for enterprise and ISPs; subscriber management systems with VPN support; firewalls with VPN support; and VPN gateways.